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ORIGINAL ARTICLE

BLOOD SAFETY & PREVALENCE OF TRANSFUSSION TRANSMISSIBLE VIRAL INFECTIONS AMONG DONORS AT THE RED CROSS BLOOD BANK IN GONDAR UNIVERSITY HOSPITAL

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ABSTRACT

Background: *Although millions of lives are saved by blood transfusion, unsafe transfusion is also putting millions of people at risk of Transfusion Transmissible Infections (TTI). In Ethiopia the safety and magnitude of blood transfusion and TTIs is not well investigated.*
Objective*: to investigate the magnitude of TTIs and assess TTI related risk factors among blood donors.*
Methods: *Cross-sectional study among blood donors at the Red Cross Society Blood Bank in Gondar University Hospital, North West Ethiopia.*
Results*: The study was conducted among 600 adult blood donors between April and July 2004. Their mean age was 28 +/- 10.4 years (range: 16-64) and 66% of them were urban dwellers. The donors included farmers (30.7%), daily laborers (22.7%) and students (20%). All the donors were first time donors and 75% of the donations were replacement donations by remunerated donors or family members. The prevalence of HIV, Hepatitis B surface antigen (HBSAg) and Hepatitis C virus (HCV) infections were 4.5% (95%CI: 3.0-6.6), 8.2% (95%CI: 6.2-10.7) and 5.8% (95%CI: 4.2-8.1), respectively. The overall discard rate of donated blood because of these viral markers was 16.3%. In univariate analysis, HCV infection was significantly associated with presence of HIV (OR: 5.36, 95%CI: 2-14.3). Experiences of traditional surgical incisions or phlebotomy were present in 93.8% of donors. While 6.5% of donors admitted a history of multiple sexual partners, none of them admitted a history of any sexually transmitted infections (STI).*
Conclusion: *The prevalence of TTIs among blood donors is very high. The majorities of blood donors are replacement or paid donors with one or more of the risk factors for TTIs implying that blood transfusion is unsafe. These findings call for the urgent implementation of the national strategy for safe blood transfusion in Ethiopia. As the utilization of advanced technology and skilled-personnel-based screening of blood are not in the immediate horizon, establishing stringent selection criteria of donors and setting clinical indications for transfusion would be indispensable and cost-effective interventions to minimize the risk of TTIs to blood recipients in Ethiopia.*

INTRODUCTION

Although millions of lives are saved from death by blood transfusion, many recipients are acquiring or are at risk of acquiring transfusion transmissible infections (TTIs) due to provision of untested or poorly tested blood and poor blood donor recruitment and selection practices. A global study on blood safety conducted from 1998-99 in 175 countries by GDBS (WHO Global Database on Blood Safety) indicated that more than 40% of the donated blood in poor countries were not screened for TTIs and 80% of the world population had access to only 20% of the global supply of safe and screened blood (1). As a consequence, about 5-10% of HIV infections in developing countries are attributable to unsafe blood transfusion (2). This is very high compared to the chance of getting HIV infection through transfusion in the developed world, which is 1 out of 500,000 transfusions (3).

The blood transfusion service (BTS) in Ethiopia is not well coordinated by a national program. The Ethiopian Red Cross Society administers about 12 Blood Banks in seven of the 11 regional states in the country, and more than 65% of the hospitals in the country do not have access to any BTS. About 60% of the blood donors in Addis Ababa and almost all of the donors in the rest of the country are family replacement donors. Recognizing the weaknesses of the existing BTS and the importance of safe transfu-

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sion, the Federal Ministry of Health has recently launched a five year strategic plan in National Blood transfusion services with the objectives to establish a nationally coordinated BTS, to promote voluntary non-remunerated and regular blood donation, to improve safety of blood, to promote appropriate and safe utilization of blood, and to establish a comprehensive quality management throughout the BTS (4).

In Ethiopia there is a shortage of blood and unsafe transfusion is also common (4-6). The prevalence of TTIs among the general population in Ethiopia are very high. The national prevalence of HIV in Ethiopia is 4.4 % and urban prevalence is 12.6% (7). The prevalence of markers of Hepatitis B exposure and Hepatitis B surface Antigen (HBsAg) in the community are more than 70% and 7-11%, respectively (8,9). Considering such high rate of exposure and infection rates, some authorities recommended that indiscriminate screening of blood donors for HBsAg may not be warranted (10), and hence until recently screening of donated bloods for HBsAg was restricted to blood to be administered to children and foreigners (5). The magnitude of HCV infection in the Ethiopian population is not well studied. Frommel D and his colleagues reported that the prevalence of Anti-hepatitis C virus antibody (anti-HCV Ab) among urban and rural Ethiopian communities was 2% (11). In Addis Ababa, seroprevalence of HCV infection was reported to be 0.9% (12). However, in patients visiting a neurology clinic of the University Hospital in Addis Ababa and in commercial sex workers in Addis Ababa, the prevalence of HCV infection was 6% (11) and 5.3% (12), respectively.

Limited studies done on the magnitude of TTIs among blood donors in Ethiopia have shown prevalence of HIV to be 4.7% and 16.7% (7, 13), of HBsAg 10% (10) and 14.4% (13), and of HCV 1.4% (11, 14). The prevalence of TTIs particularly HIV, HBV, and HCV among blood donors in other African countries is also very high (15, 16). Although studies indicating the magnitude of transmission of TTIs to blood recipients in Ethiopia are not available, considering the lack of national transfusion policy and guidelines compounded by the non-reliable supply of test kits, poor infrastructure and less qualified personnel working in the blood banks, the risk of acquisition of TTIs through blood transfusion is expected to be high.

We conducted a cross-sectional study at the Red Cross Society Blood Bank in Gondar University hospital with the aims to assess the prevalence of HIV, HBV and HCV infection among adult blood donors and to investigate risk behaviors in harboring TTIs.

METHODS AND MATERIALS

Gondar University Hospital is a teaching and referral hospital in Northwest Ethiopia with more than 350 active beds. The hospital has a Blood "Bank" owned by the Ethiopian Red Cross Society. The blood bank is run by two technicians and a nurse. Donated bloods are regularly tested for HIV, but tests for Hepatitis B virus (HBV) and syphilis are done irregularly. At times when there are shortages of supplies like collecting bags, patients are pre-tested for HIV before donating blood. Testing of donors for HIV is not linked to the VCT in the hospital.

In 2003/2004, blood was collected from 1761 donors. About 75% were family replacement and/or remunerated donors. Almost all the donors were first time donors. About 13.8% of the donated blood in same year was discarded mainly due to TTIs (10.3%). The Bank has only five volunteer members who donate blood on a regular schedule.

The Blood Bank has an operational manual prepared by the National Blood Transfusions Services of the Ethiopian Red Cross Society. It uses a Donor Enrollment Form which contains among other things lists for identifying donors whose health could be jeopardized following donation of blood. It lacks a comprehensive list of risk behaviors or body signs which can help identify donors who are potential carriers of TTIs.

This study was cross-sectional, and was conducted between April and July 2004 at the Ethiopian Red Cross Blood Bank in Gondar University Hospital in Northwest Ethiopia. Donors who gave verbal consent to participate in the study were included. A questionnaire to collect additional demographic data and risk behaviors or factors for TTIs (history of transfusion, tattooing, jaundice or close contact with jaundiced person, surgical incisions or phlebotomy by traditional healers, STI, and multiple sex partners) was administered by the technician in the bank. Blood collected from all the participating donors was tested for the presence of antibodies against HIV 1 & 2 and HCV, and HBsAg using commercially available tests (MicroELISA System Vironstika HIV Uni -Form II Ag/Ab (bioMerieux bv, The Netherlands), ACON HCV-Test Strip (ACON Laboratories, inc., USA), and Micro ELISA system, Hepanostika HBsAg Uni-Form II (bioMerieux bv, The Netherlands)). None of the donors returned to know the results of the tests performed during this study.

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office has granted the ethical clearance to conduct this study in the hospital.

Data are entered and analyzed using Epi Info 2000 version 3.2.2. Descriptive analysis is done to determine means and frequencies. Chi square is used to compare proportions and odds ratio is used to assess risk. Linear and logistic regression analysis are done to look for interactions among the various risk behaviors and factors. Significance level is defined as probability less than 0.05

RESULTS

The study included 600 adult blood donors of whom 89.5% were men. The mean age of the donors was 28.9±10.4 (range 16-64 years). About 66% of the donors were urban dwellers. The three major groups of donors were farmers (30.7%), daily laborers (22.7%), and students (20.7%). (Table-1). About 75% of the donations during the study period were replacement donations either by family members or remunerated donors. All were fist time donors.

The over all prevalence of TTI was 16.3%. The prevalence of HIV, HCV, and HBsAg were 4.5% (95%CI: 3-6.6), 5.8% (95%CI: 4.2-8.1), and 8.2% (95%CI: 6.2-10.7), respectively. A single TTI was detected in 87 (14.5%), dual infection in 9 (1.5%), and triple infection in 2 (0.3%) of the donors. Distribution of HIV was not affected by sex and area of residence. However, prevalence of HBsAg was significantly higher among rural (12.4%) than urban (6%) donors (p=0.006). There was no significant difference in distribution of either HBsAg or HCV infection by sex and marital status.

More than 93% of the donors had experienced traditional surgical incisions or phlebotomy. Although 6.2% of the donors admitted practicing sex with multiple sexual partners, none of the donors reported a history of STI (Table 2). Three of the donors were recipients of blood transfusion in the past, and one of them has HIV and another one HBsAg. In a univariate analysis no statistical association was established between the presence of risk behaviors and/or factors and the presence of any of the three TTIs. Four HBsAg positive donors and six HCV positive donors were co-infected with HIV. There was an association between HIV and HCV infection (OR: 5.36, 95%CI: 2-14.3) but not with HBsAg (Figure 1).

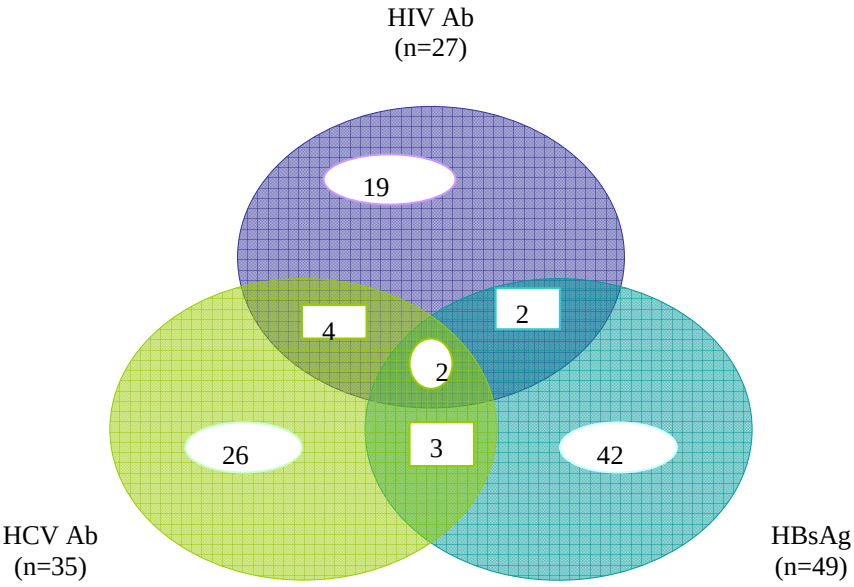
Table-1: Socio-demographic characteristics, and prevalence of TTIs among blood donors at the Red Cross Blood Bank in Gondar University Hospital, Northwest Ethiopia, April-July 2004

Demographic variables N (%)		**All donors (N=600)**		**HIV positive (N=27)**		**HBsAg positive (N=49)**		**HCV positive (N=35)**
Prevalence	No.	16.3%	No.	4.5%	No.	8.2%	No.	5.8%
Age: Mean ±SD (range)		28.9±10.4 (16-64)		30.8±9.5 (19-64)		30.7± 8.9 (18-60)		31±12 (18-64)
Male sex (years)	537	89.5	511	85.2	551	91.8		88.6
Residence: Urban	399	66.5	422	70.4	294	49.0*	326	54.3
Rural	201	33.5	178	29.6	306	51.0	274	45.7
Marital status								
Single	324	54.0	356	59.3	319	53.1	274	45.7
Married	255	42.5	222	37.0	258	42.9	326	54.3
widowed	20	3.3	23	3.7	27	4.5	0	0.0
divorced	1	0.2	0	0.0	0	0.0	0	0.0
Occupation								
Farmer	184	30.7	178	29.6	269	44.9	257	42.9
Daily laborer	124	20.7	111	18.5	122	20.4	155	25.9
Student	120	20.0	88.8	14.8	61	10.2	52	8.6
Employed	71	11.8	133	22.2	61	10.2	35	5.8
others#	90	14.8	89	14.8	86	14.3	103	17.2

Table 2: Distribution of risk behavior and factors in relation to occurrence of TTIs among blood donors at the Red Cross Society Blood Bank in Gondar University Hospital, Northwest Ethiopia, April-July 2004 (N=600).

Risk Behavior/ factor	All		HIV Positive		HBs Ag Positive		HCV positive	
	No	(%)	No	(%)	No.	(%)	No.	(%)
History of transfusion	3	0.5	22	3.7	12	2.0	0	0.0
History of jaundice	20	3.3	44	7.4	12	2.0	52	8.6
His story of contact with jaundiced person	11	1.8	0	0.0	0	0.0	34	5.7
History of STI	0	0.0	0	0.0	0	0.0	0	0.0
Multiple Sexual partner	38	6.2	44	7.4	37	6.2	17	2.9
Tattooing (non-fancy)	75	12.5	89	14.8	73	12.2	49	8.1
Traditional surgical procedures	563	93.8	578	96.3	564	94	548	91.4

Figure 1: The prevalence of HIV Ab, HBsAg and HCV Ab among blood donors at Red Cross Blood Bank of Gondar University Hospital, Northwest Ethiopia, April-July 2004.



$: *Association between HIV and HCV = OR: 5.36, (95CI: 2-14.3)*

Finally, though the blood bank's manual advises not to collect blood from certain group of donors we found that blood was collected from individuals with history of multiple sexual partners, previous blood transfusion recipients, and long distance track drivers.

DISCUSSION

This cross-sectional study indicates that more than 16% of the blood donated was discarded because of the presence of any or combined infection with HIV, HBsAg and HCV. This figure is comparable to reports from Malawi (17). All cause (infections and others) discard rate of donated blood in Ethiopia and other developing countries is more than 30% (6, 18). In developing countries where the collection of blood is very insufficient i.e. less than 30 units per 1000 population per annum and where discard rate of donated blood is very high, utilizing alternative fluids such as crystalloids and colloids, and establishing stringent clinical indications for transfusion may be preferred options. Using tight donor selection criteria would not only help to exclude TTI carriers but also would help to economize utilization of infrequently available supplies like collecting bags.

The prevalence of HIV among donors in this study is 4.5% which is comparable to the national prevalence of HIV among blood donors in Ethiopia (7) but is significantly lower than the 12.8% reported by Rahlenbeck S et al (13) from the same blood bank in 1997. The sentinel prevalence study among pregnant women in Gondar has not shown a comparable reduction in HIV prevalence (7). This apparent reduction in HIV prevalence could be due to difference in the composition of donors or self-deferral from donation due to awareness of ones risk behaviors to HIV. While there are no soldiers in the current study, soldiers were important donors in the previous study in whom HIV prevalence was up to 30%. Though our study was conducted in a relatively short period, it may indicate a change in trend of selection of donors i.e. deferral of donors from some group of individuals like soldiers, contributing to the apparent decline in HIV rate among donors. Studies have indicated that introduction of pre-donation deferral policies of donors from groups of individuals or institutions who are at a high risk of harboring TTIs has significantly decreased risk of transmission of TTIs (19).

HBsAg was detected in about 8.2% of the donors which is lower than previously reported rate of 14.4% (13) from the same Blood Bank but it is similar to figures reported from Addis Ababa (8.2%). In agreement with the previous report from the same site (13), HBsAg was more prevalent among rural residents. The mechanisms of transmission of Hepatitis B virus among the populations in developing countries have been unsettled issue. Studies have indicated that there is a possibility of horizontal transmission of HBV among crowded family members (21) ,and vertical or perinatal transmission HBV among Ethiopian population is not common (22). More than 60% of the population in Ethiopia has one or more markers of HBV infection, and hence some authorities previously had recommended that routine screening of blood for HBsAg may not be cost-effective and not warranted (10). Despite this however, WHO (1) and many other studies from Africa recommended the routine screening of donated blood for HBsAg (15-17).

The prevalence of HCV in the general population in Ethiopia is not well investigated. A survey conducted in 1993 found a prevalence of 2% in the community (11). The prevalence of HCV in the current study is 5.8% which is higher than the rate in the general population. This figure is, however, comparable to the 6% prevalence among patients attending Neurology Clinic in Addis Ababa (11) and to the 5.3 prevalence among commercial sex workers in Addis Ababa (12). It is, therefore, possible that the donors of the current study may exhibit similar risk behaviors for acquisition of HCV Furthermore, presence of HCV in the donors was associated with the HIV seropositivity. This association has been documented in a community survey in Addis Ababa (12). The association could be due to shared risk factors for both infections (12, 23). However, it is also surmised that HIV may increase the susceptibility for HCV infection through unknown mechanisms (23).

The majority of the blood donations were replacement and first time donations from family members and/ or remunerated donors. It is well known that replacement and first-time donors have higher prevalence of TTIs than voluntary non-remunerated donors (1, 25). In countries where prevalence of TTIs in the general population is high, low risk donors can be recruited by implementing stringent donor selection criteria. A Model Transfusion Services in Zimbabwe selection of donors with HIV prevalence as low as 0.7% and 2.3% in regular donors and new blood donors, respectively, was achieved compared to HIV prevalence of 25.8% in the general adult population (1). The introduction of behavioral risk factor screening among potential donors has made a significant contribution to progressive reduction in the incidence

and prevalence of TTIs in donors in developed countries (26).

There is a need of refresher training for the technicians so that the recommendations on the blood bank manual are adhered to. More over, the donor enrollment form needs to be updated to include more exclusion criteria with clear guidance on inclusion and exclusion criteria.

In conclusion, very high rate of TTIs among blood donors was found. The majority of blood was collected from replacement donations, first time and remunerated donors. These made blood transfusion unsafe. These showed the urgent need to introduce safe blood transfusion services. While assuring safety of blood transfusion using high technology screening methods and qualified personnel are not in the immediate scope, establishing and implementing rigorous donor selection criteria, providing refresher training to personnel working in Blood Banks, improving availability of alternative fluids like crystalloids and colloids, and controlling liberal transfusion of blood to patients are cost effective and proven ways of decreasing risk of transmission of infections to blood recipients.

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